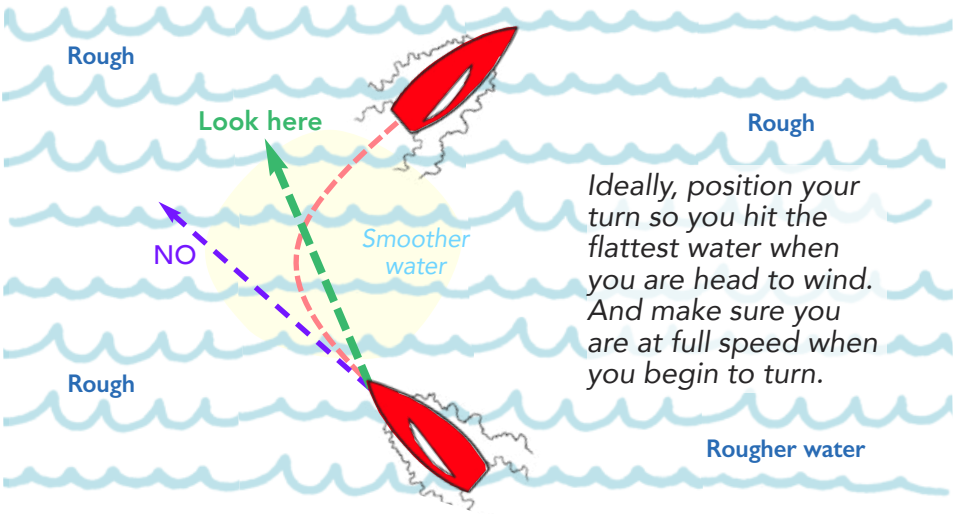
Dave Dellenbaugh's
SPEED&Smarts™
The digital newsletter of how-to tips for racing sailors Winter 2023

WAVES: The enemy of tacking!

The spray in the photo above is pretty spectacular, but it's not what this crew wants to see in the middle of their tack. A big splash means the boat has plowed into a wave and displaced a lot of water. This is slow on any angle of sail, but especially when you are tacking because you have no power in the sails to punch through the waves. So try to tack where the water is flatter (or avoid tacking if possible), and minimize the amount of time you spend heading straight into the wind, perpendicular to the waves.



Ideally, position your turn so you hit the flattest water when you are head to wind. And make sure you are at full speed when you begin to turn.

When you're trying to find a smooth spot to tack, don't look straight ahead. The waves on your bow won't be a problem once you start turning, so look about 30° or 40° to windward of your bow instead. That's where you will spend most of your tack.

ISSUE #155

TACKING

Free Webinar on Issue 155!

Please join Dave to discuss this issue in greater depth. Many of the photos on these pages were taken from videos of boats tacking. Dave will show those videos and go into further detail about tacking technique and tactics. Your questions are welcome.

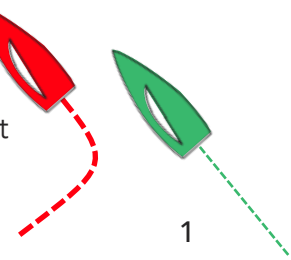
Free for S&S subscribers only!

When: March 1 @ 8 pm EST

REGISTER Click here to get info, ask a question, and get a link for the webinar.

Choose where to tack!

When the water is rough, the cost of tacking in bad waves can be huge. So make sure you pick the very best spots to tack. Keep your eyes out of the boat and wait for the right moment. Try to tack **only where you choose**. It's tough to make a good lee-bow tack, for example, because you can't control the waves at that exact moment.



The ingredients of a 'perfect' tack

Turning rate and timing

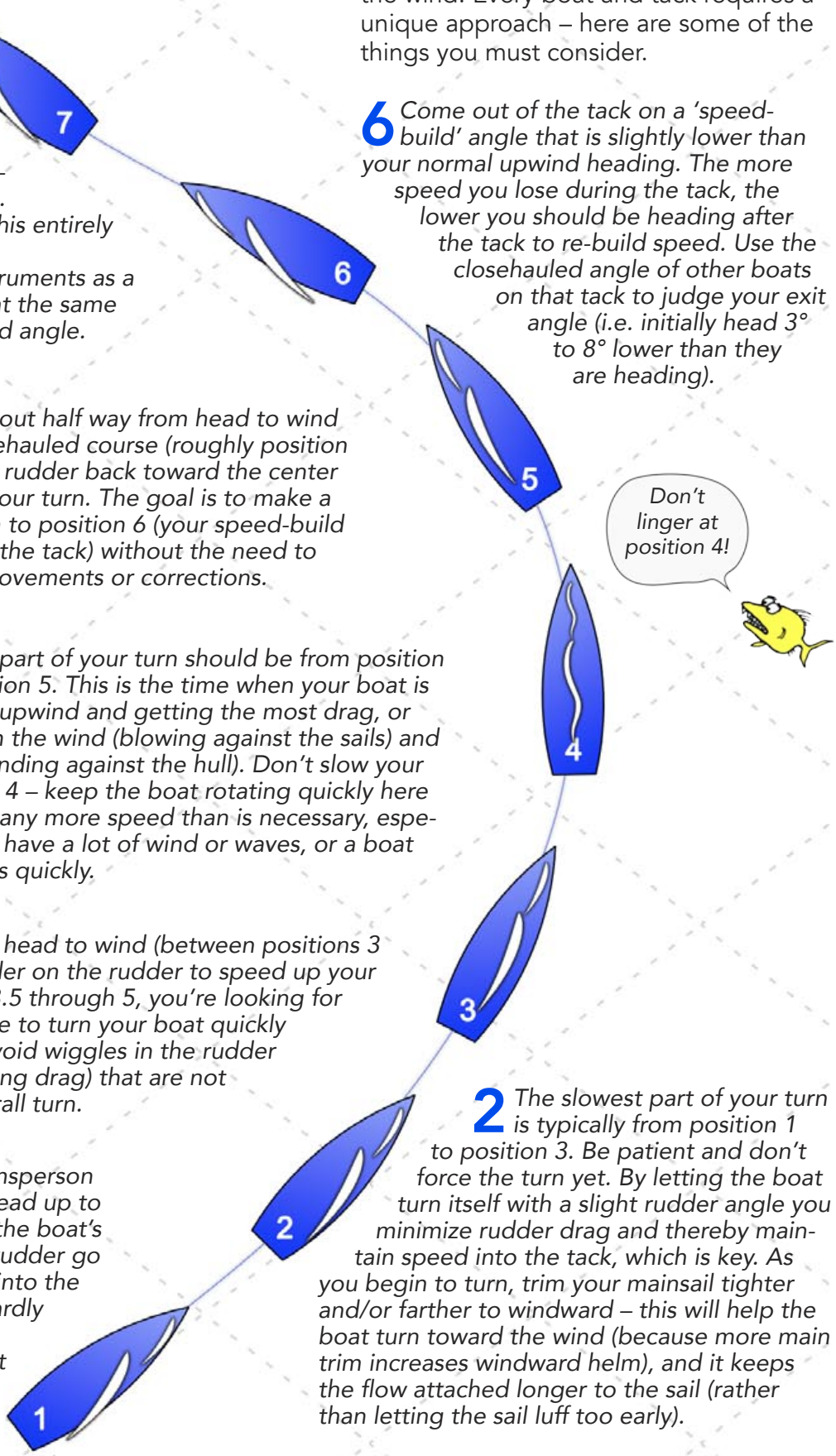
A good tack depends on turning the boat at the proper rate as you rotate through the wind. Every boat and tack requires a unique approach – here are some of the things you must consider.

7 *As your speed increases after the tack, gradually head up so you reach your optimal up-wind speed and your ideal close-hauled heading at the same time.*

- *In a small boat you must do this entirely based on your sense of feel;*
- *In bigger boats, use your instruments as a guide to hit your 'target' speed at the same time you get to your optimal wind angle.*

6 *Come out of the tack on a 'speed-build' angle that is slightly lower than your normal upwind heading. The more speed you lose during the tack, the lower you should be heading after the tack to re-build speed. Use the closehauled angle of other boats on that tack to judge your exit angle (i.e. initially head 3° to 8° lower than they are heading).*

5 *When you are about half way from head to wind to your new closehauled course (roughly position 5), start moving your rudder back toward the center of the boat to slow your turn. The goal is to make a gradual, smooth turn to position 6 (your speed-build angle coming out of the tack) without the need to make jerky rudder movements or corrections.*



4 *The fastest part of your turn should be from position 3.5 to position 5. This is the time when your boat is aiming directly upwind and getting the most drag, or resistance, from the wind (blowing against the sails) and the waves (pounding against the hull). Don't slow your turn at position 4 – keep the boat rotating quickly here to avoid losing any more speed than is necessary, especially when you have a lot of wind or waves, or a boat that decelerates quickly.*

3 *As you approach head to wind (between positions 3 and 4), push harder on the rudder to speed up your turn. From position 3.5 through 5, you're looking for a steady rudder angle to turn your boat quickly through the wind. Avoid wiggles in the rudder (and the corresponding drag) that are not essential for the overall turn.*

2 *The slowest part of your turn is typically from position 1 to position 3. Be patient and don't force the turn yet. By letting the boat turn itself with a slight rudder angle you minimize rudder drag and thereby maintain speed into the tack, which is key. As you begin to turn, trim your mainsail tighter and/or farther to windward – this will help the boat turn toward the wind (because more main trim increases windward helm), and it keeps the flow attached longer to the sail (rather than letting the sail luff too early).*

1 *The tack begins with the helmsperson allowing the boat to gently head up to windward. Stop fighting against the boat's natural windward helm – let the rudder go so the boat slowly starts turning into the wind. If you don't have any (or hardly any) windward helm, try moving some crew weight to leeward just before the tack to induce a bit of windward helm.*

Tacking trim and crew dynamics

1 Preparing for a tack

Make sure you are at <u>full speed before</u> you turn the boat – don't maneuver when you're slow. Look ahead and to windward to find a smooth spot where you can make your turn. Alert the crew when a tack is coming – often a '3-2-1-Tacking' countdown is helpful. Be sure to give sail trimmers time to get sheets in their hands. The crew should not move (e.g. lean into the boat) until it is essential to do so.

2 Turning into the wind

As you begin your tack, overtrim the main slightly (by pulling harder on the sheet and/or moving the traveler to windward) to create more windward helm, which helps the boat turn to windward. Begin your tack by gradually letting the boat turn toward the wind (on this keelboat the tiller at first goes only as far as the inside edge of the cockpit seat – about 30° to leeward). Don't ease the sheet for either sail until at least 50% of that sail is luffing.

3 Passing head to wind

Shortly before you reach head to wind, push the tiller farther to leeward (or turn the wheel to windward) to speed up the turn. The helmsperson should hold the end of the hiking stick so he or she can push the tiller far enough to leeward without moving his or her weight that way. Just before the boat is head to wind, all crew should hike hard on the old windward side to help roll-tack the boat (unless it's windy, in which case they move quickly to the new windward side to do a 'flat tack').

4 Accelerating on the new tack

Start slowing your rate of turn when you're half way between head to wind and a new closehauled course. Aim for an exit angle that is typically 3° to 8° lower than your normal upwind heading (come out of the tack slightly lower than nearby boats already sailing on that tack). Don't 'back' your jib during the tack. To make it easier for the driver to find the right exit angle, the jib trimmer should pull the jib in to the same point coming out of every tack (as long as conditions stay the same).

5 Back to full speed closehauled

As the boat builds speed, head up slowly to your normal upwind heading. Try to hit full speed at the moment you reach a closehauled angle. Unless it's windy enough to be fully hiked, have one (or more) crew member(s) linger in the middle to balance the boat (i.e. keep the right heel angle) coming out of the tack. When it's windy, coming out of a tack is one of those times when you want the crew fully hiked. Look at the arm held to windward for max leverage!

How fast should you turn in a tack?

Should your next tack be a quick, sharp turn, a slow arcing curve, or something in between those extremes? It depends . . . on the wind, the waves and the type of boat you're racing.

Every tack occurs in a unique combination of the factors above, and therefore it requires a unique approach. If you're sailing in big, steep waves, don't tack too slowly or you'll get crushed pounding into the waves in the middle of the tack. Conversely, when you're racing a big boat in flat water, don't turn too sharply or you'll create extra rudder drag (and it will be hard for the crew to trim the sails and cross the boat).

You lose distance in almost every tack – so the key to success is continually looking for the turning rate where you will lose the least.

In the middle of a tack, a boat aims directly into the waves and the wind. Sailing straight upwind and perpendicular to the waves is the worst possible angle for maintaining speed, so don't loiter in this position. When you have waves like the ones shown here, speed up your tacking turns.

Why you should make a

FAST TURN

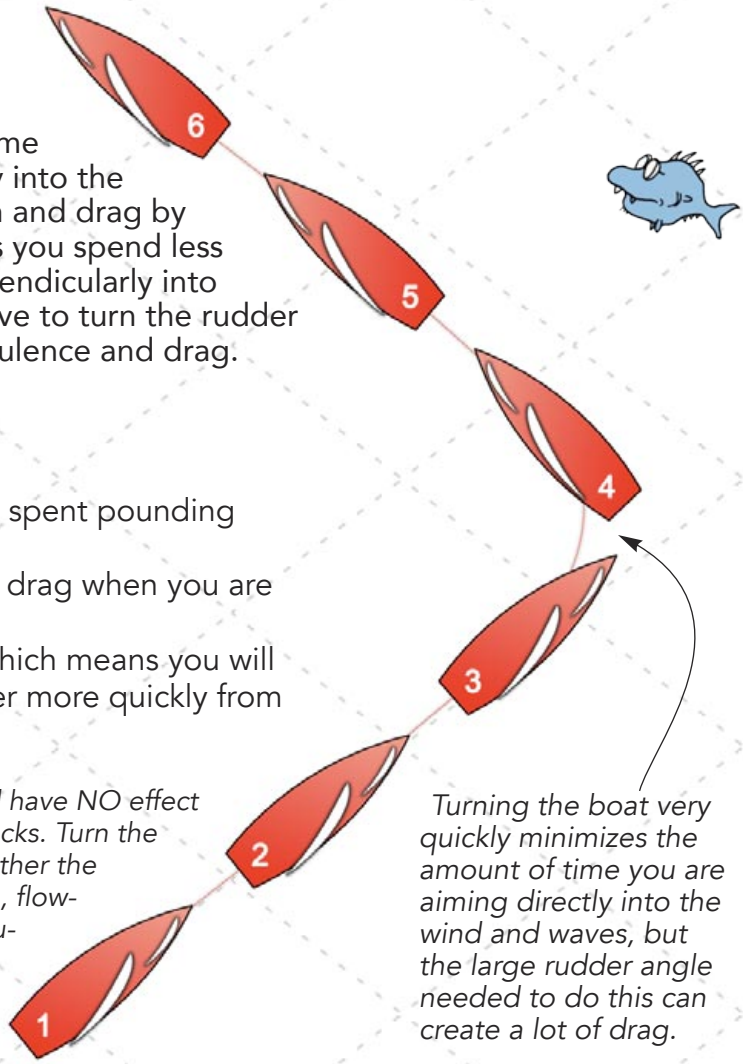
One of the biggest problems with tacking is the time you spend in the middle of the tack sailing directly into the wind and waves. You can reduce this costly friction and drag by turning the boat more quickly. A faster tack means you spend less time with sails luffing and the boat pounding perpendicularly into the waves. However, in order to tack faster you have to turn the rudder farther off centerline, and this creates its own turbulence and drag.

Rules of thumb:

Turn more **quickly** through a tack when:

- The waves are big (so you want to minimize time spent pounding perpendicularly into the waves);
- The wind is strong (and therefore creates a lot of drag when you are aiming directly into it with sails luffing);
- Your boat accelerates and decelerates quickly (which means you will slow more when aiming into the wind and recover more quickly from loss of speed due to a sharper turn).

*The presence of **current** should have NO effect on the speed or path of your tacks. Turn the boat exactly the same way whether the current is 0.2 knots or 2.0 knots, flowing with, against, or perpendicular to the wind direction. (If the current creates bigger waves, do take those into account.)*

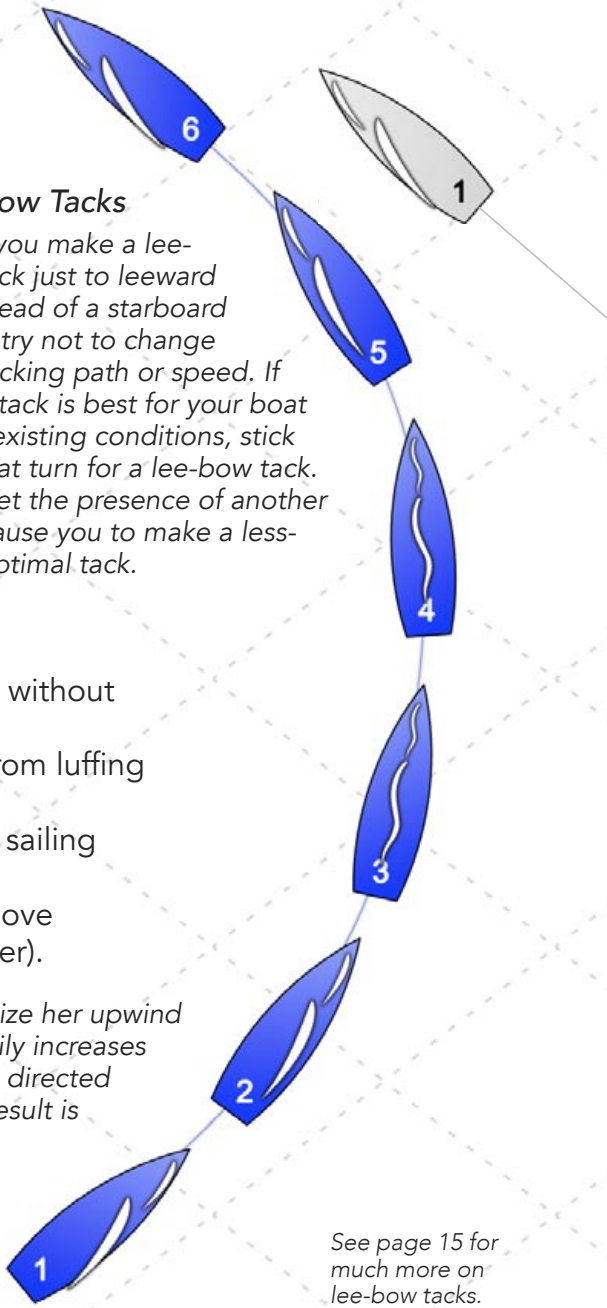


Turning the boat very quickly minimizes the amount of time you are aiming directly into the wind and waves, but the large rudder angle needed to do this can create a lot of drag.

Why you should make a

SLOW TURN

The big advantage of turning slowly through a tack is minimizing the amount of drag created by your rudder. A slow tack (i.e. one with a greater turning radius) doesn't require angling the rudder so far, which means the rudder won't create as much turbulence and drag. Less rudder angle is especially helpful for boats that don't turn so easily – including boats that are longer, heavier, with longer keels or inefficient rudders. The problem with slow turns, of course, is that you spend more time pointing into the wind being slowed by waves and luffing sails. Sometimes these effects are significantly greater than rudder drag.



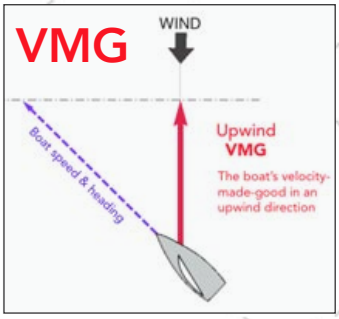
Lee-Bow Tacks

When you make a lee-bow tack just to leeward and ahead of a starboard tacker, try not to change your tacking path or speed. If a slow tack is best for your boat in the existing conditions, stick with that turn for a lee-bow tack. Don't let the presence of another boat cause you to make a less-than-optimal tack.

Rules of thumb:

Turn more **slowly** through a tack when:

- The water is flat (so it's easier to coast upwind for a longer time without losing speed due to hitting waves);
- The wind is light or moderate (which means there is less drag from luffing sails than when it's windy);
- Your boat's hull shape is not designed for fast turns (e.g. you're sailing a bigger, heavier keelboat, especially one with a long keel);
- Your crew needs more time to tack the boat properly (e.g. to move across the boat and/or trim the genoa from one side to the other).



A boat's goal when racing upwind is to maximize her upwind velocity-made-good (VMG). Tacking temporarily increases VMG because all the boat's speed is suddenly directed straight upwind. But every time you tack the result is an overall net loss of VMG (compared to no tack). It's never fast to aim your boat into the wind with sails luffing, so don't use VMG as a reason to coast upwind any longer than necessary during a tack. If this was fast, boats would be doing it all the time.

See page 15 for much more on lee-bow tacks.

Nacra 18 catamaran

Any boat that decelerates and accelerates quickly (like this lightweight catamaran) will usually perform best with quick tacks. The whole idea when tacking is to: a) minimize time spent head to wind (because the boat carries very little momentum and will quickly lose headway and steerage), and b) get onto the new tack as soon as possible (because once the sails fill on the new tack the boat will accelerate quickly to full speed). The rudder drag created with a quick turn is a small cost for getting on to the new tack sooner. However, tacking a catamaran is still costly overall. The boat goes 10 or 15 knots upwind, but slows to nearly zero in a tack – you don't want to be doing that too many times on a beat.

Weigh the cost of each potential tack

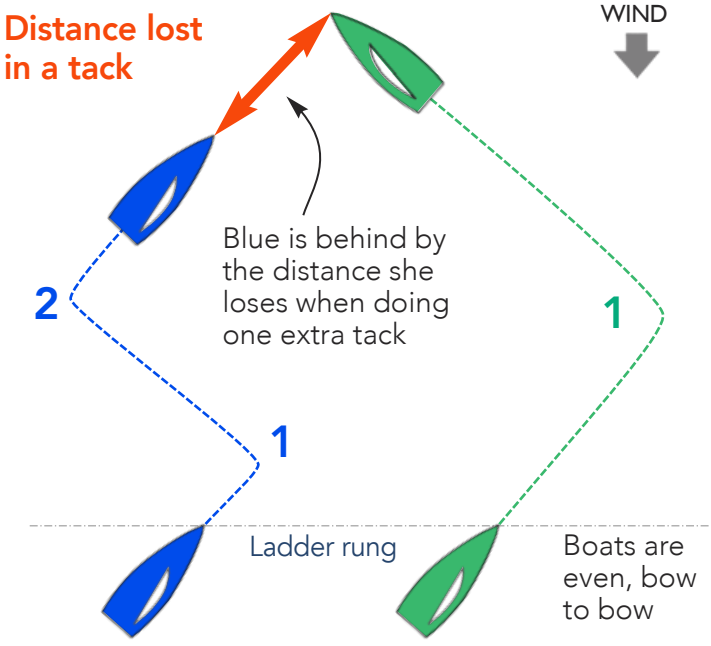
There's no doubt that tacking is almost always slower than sailing in a straight line (in the absence of tactical and strategic factors). If tacking was faster, we'd see boats zig-zagging a lot more. But we don't see that because those boats would get a little farther behind with every tack.

So the first rule of thumb for sailing upwind is: Minimize the number of tacks you make. Cut out tacks and you will reduce the distance you lose.

However, you can't totally eliminate tacking. You have to tack (at least once or twice) to get to the windward mark, and many times tacking is the best (and only) way to take advantage of changes in the wind direction or pressure.

So tacks are costly, but they're often helpful. The key to tacking success, then, is knowing how much you'll lose if you tack so you can make an informed decision about whether it's worth taking that loss. If you can gain more as the result of tacking than you lose by doing the actual tack, then it is usually a good move to turn the boat.

The hard part is that the cost of a tack is not fixed. It changes all the time based on the type of boat you're sailing, the ability of your crew, the wind speed, and the sea state. You have to think about all these things when deciding whether any tack will be worthwhile.



This diagram shows one way to visualize how much distance a boat loses in one tack. This distance will be different every day based on the type of boat, wind speed and wave state.

Estimate the cost of tacking for <u>your</u> boat

Your boat		Distance Lost in a Tack (boatlengths)	
		Flat water	Waves
WIND	Light		
	Medium		
	Heavy		

Do you know how much distance you lose each time you tack in various conditions? Take some time to fill in this chart and think about how the cost of tacking (in <u>your</u> boat with <u>your</u> crew) changes based on wind speed and wave state.

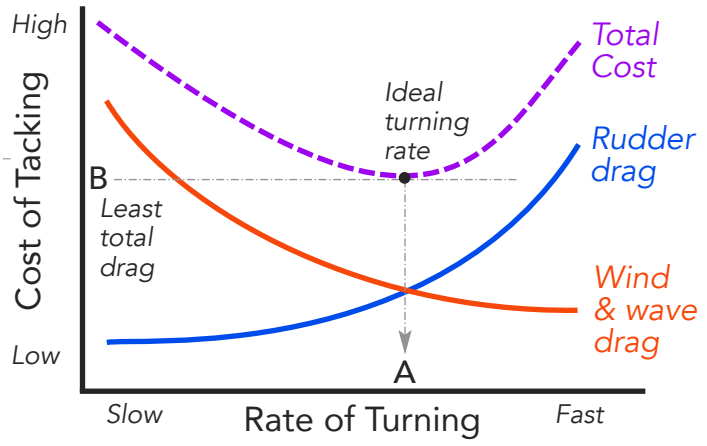
In which condition will a tack be most costly? In which condition will you lose the least distance?

Almost all boats lose more distance when tacking in waves than in flat water, and most lose less in medium wind than they do in lighter or stronger breeze. The worst condition for tacking is typically light wind and waves.

It's important to know this so you can judge whether it's worth tacking for various strategic or tactical reasons. For example, should you tack on a small header? In medium air and flat water, the answer might be yes. But in light air and chop, the distance you lose in a tack will likely be greater than what you would gain by playing the shift.

More on the ideal rate of turning in a tack

(From pages 4-5) If you turn too fast in a tack you'll create excess rudder (and hull) drag, which is slow. But if you turn too slowly, the hull and sails will create a lot of drag while the boat is aiming into the wind. The ideal turning rate (A) is somewhere in the middle, where the combined amount of drag is least (B). This changes according to conditions.



Cost of tacking a light one-design dinghy

Light dinghy		Distance Lost in a Tack (boatlengths)	
		Flat water	Waves
WIND	Light	0	1
	Medium	.5	1
	Heavy	1	1.5

Here's a rough guess at how the crew of a dinghy (e.g. Laser, Snipe, Thistle, Melges 15, 420, FJ) might fill in the tacking chart on the previous page.

• In a boat that can be roll-tacked (assuming good technique by the crew), the overall cost of tacking is not great (an average of maybe one length per tack). This means tacking is usually a more viable option than it is in heavier keelboats.

• In light air and flat water, many dinghies can be roll-tacked with zero loss of distance. When this is the case, don't hesitate to tack for even the most subtle tactical and strategic reasons.

• When tacking, waves are not your friends (especially in lightweight boats that don't carry momentum while turning head to wind through waves). In choppy conditions, cut down on the number of tacks. When you must tack, look hard for a smoother spot to do it.

• In heavy air, the drag caused by luffing sails is significant in lighter boats. So when you have to tack, speed up your turn to minimize the amount of time spent aiming into the wind.

Cost of tacking a slower, heavy keelboat

Heavy keelboat		Distance Lost in a Tack (boatlengths)	
		Flat water	Waves
WIND	Light	2	3
	Medium	1	2
	Heavy	1.5	2.5

Here's a rough guess at how a keelboat crew (e.g. J70, Etchells, J/105, handicap racer) might fill in the tacking chart on the previous page.

• All boats lose speed when they make big turns (i.e. tacks) and spend time sailing directly into the wind and waves. The problem with heavier boats (i.e. keelboats) is that once they lose speed, it takes longer for them to accelerate and get back to their normal upwind speed. That's why, in general, the cost of tacking a keelboat is greater than a lighter dinghy. And therefore, tacking is not as good a tactical option as it usually is for a dinghy.

• The worst condition for tacking a heavy boat is when you have light air and waves. This combination compounds the challenge of accelerating and pointing after a tack. It's not uncommon for keelboats to lose multiple boatlengths during each tack in these conditions, so keep the boat moving and avoid non-essential maneuvers (e.g. tacks).

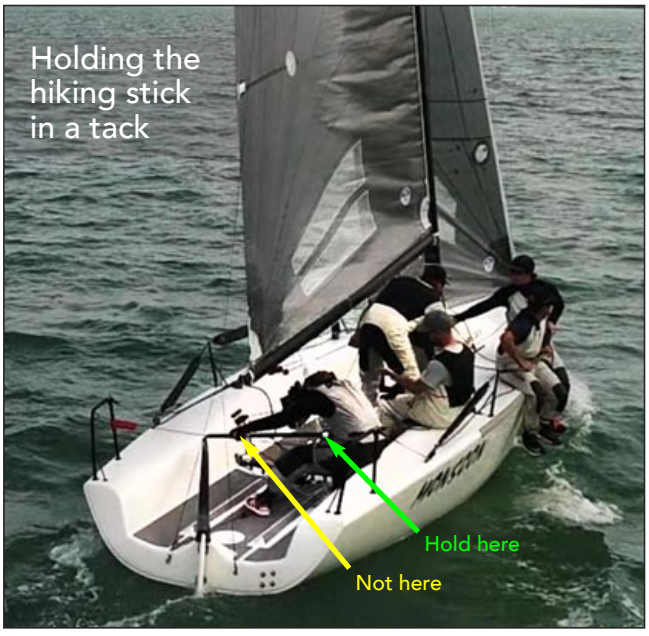
• Other factors that may contribute to more costly tacks in bigger boats include the challenge of tacking with a genoa jib and/or a lot of crew.

Should you limit how many tacks you make on a beat?

I once heard a 49er sailor claim he didn't do very well on the first beat because he exceeded his coach's permitted number of tacks. The 49er skiff goes super fast in a straight line, but it stops almost completely when tacking. So you don't normally want to tack very much, and in this case the coach suggested that his sailors not make more than four tacks per beat. A guideline like this is helpful because it says, 'Don't tack unless you really need to' – great advice when tacking is slow.

But you have to be sensible about this. Let's say the 49er crew was sailing up the beat and had already done their four tacks. If they see a puff on their windward side, should they do a fifth tack to get into the puff, or keep going straight so they don't do more than four tacks? The answer is pretty clear – they should do the right thing at that moment. At that point it didn't matter how many tacks they had done earlier in the beat – if tacking would get them to the top mark sooner, they should go for it!

Most small, light boats can roll-tack quite well and don't lose too much when tacking. This means tacking is a better, easier option for them than it is for bigger, heavier boats. A good roll-tacking boat can tack to play a small header, go for a subtle increase in pressure, or escape even the most benign wind shadow. The key to success is good tacking technique – better tacks mean less distance lost and more options for taking advantage of tactical and strategic options.



Key considerations for tacking a small boat

In most one-designs, the key to a good tack is a good roll. Just before the boat reaches head to wind, hike hard on the new leeward side until the rail is almost in the water; then switch sides and aggressively flatten the boat. The bigger the roll, the more power you can generate this way. Of course, you're not allowed to increase your speed as a result of a tack, but your goal should be to come out of the tack with as little decrease in speed as possible. When it's windy and you're overpowered, don't roll at all – in these conditions your goal is a 'flat tack' where the boat never heels as you tack.

Notes on photo above: • Keep sails eased slightly as you flatten because flattening makes the apparent wind shift aft. • Adjust the relative trim of main and jib so when you flatten the boat it goes straight; you don't want to have to turn the rudder (which creates drag) to keep the boat sailing closehauled as you accelerate.

When tacking in light-to-medium air, every crew member must help roll tack the boat, including the skipper. This is especially important on a heavy keelboat that is harder to roll. As the tack begins, the skipper should be holding the very outer end of the hiking stick so she can push the tiller to leeward and simultaneously lean the other way (to windward) to help roll the boat.

In this photo, however, the skipper is holding the hiking stick way in by the tiller, so in order to turn the boat she has to lean in to push the tiller to leeward. When that happens her weight is acting counter to the roll tack (and to the movement of her teammates).

Tacking a big boat

Bigger, heavier boats carry their momentum better than short, light boats, but they can't turn as sharply so they spend more of their tacking time heading into the wind with sails luffing and the bow pounding into waves. This can be a quick momentum-killer.

Once a heavy boat loses momentum, it takes a long time for her to accelerate up to full speed again. The heavier the boat, the more costly it is to tack in general, so heavy-boat sailors have to be quite a bit more selective about when they tack on a beat. Too many tacks is definitely slow.

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Check out Dave's webinar schedule.
Replays of past webinars are for sale here.

Key considerations for tacking a big boat

- Don't turn too fast in a bigger, heavier boat or:
  - you will lose speed due to rudder drag;
  - the crew won't have time to cross the boat; and
  - the genoa will likely be luffing after the tack.
- Bigger boats have big crews, so communication is key to good tacks. Don't even think about tacking without giving everyone sufficient advance warning.
- If it's windy, don't turn the boat too far in a tack. If you exit the tack on a low speed-build angle (as you would in light air), the boat will power up quickly and heel over. Your crew will have a hard time getting to the high side, it will be very tough to trim the genoa properly, and the rudder will load up with windward helm (slow!). Instead, slow your turn when you are still slightly above closehauled. Let the crew trim the jib and start hiking hard, and then bear off a little more.
- Don't forget to roll tack! Many big boat sailors think their weight doesn't matter, but it does.
- Don't end the tack with the main cleated. You will almost always have to make main-trim adjustments, so the trimmer should keep it in their hand. In light wind, you'll have to ease for speed; in heavy air, you may have to ease to keep the boat from heeling over too far (and developing too much windward helm).
- For PHRF sailors, it's helpful to think about how much time you will lose in each tack. If you know a tack costs 15 seconds, for example, it's easier to decide whether that tack is worthwhile or not.
- There are two ways to make tacks less costly: Improve them, or eliminate (some of) them!

When does tacking really make sense?

The last two pages covered a fundamental problem with tacking – almost every boat, in any wind and wave condition, loses distance (and time) whenever she tacks. Besides being costly, tacks can also be risky – you might foul another boat (*see page 14*), capsize, get an override on your genoa sheet, etc.

So whenever you have doubts about whether tacking is the right thing to do – **don't tack!** Keep going full speed ahead and wait until you are convinced that tacking is definitely the right move. Here are some rules of thumb to help you make decisions about whether or not to tack.

As a rule of thumb, don't tack when:

- **You are sailing upwind at less than full speed**. In general, you should make maneuvers (like tacks) only when you are sailing fast. So when you know you will need to tack, build speed first.
- **You are sailing in a lull**. In a lull you will be sailing relatively slowly, which is not a good time to tack. Try to maneuver in puffs, not lulls.
- **You're about to sail into bad waves**. Hitting waves in the middle of a tack can be extremely costly. Keep an eye on the water ahead and, unless a tack is urgent, wait for a flat spot.
- **Your crew is not ready!** This is another really bad time to tack. Always be prepared by keeping your eyes out of the boat, planning your tacks in advance, and giving your team a solid warning. The larger your crew, the more critical this is. Treat your team right by not surprising them!

Don't tack when a strategic or tactical rule of thumb says keep going straight. This includes:

- **You are sailing on a *lift*.** In a shifty breeze, don't tack off a lift because then you'll be sailing on a header.
- **You are sailing on the *longer tack*.** Don't tack because then you will be on the shorter tack and heading toward the closer layline.

JH Peterson photo

To tack or not to tack, that is often the question!

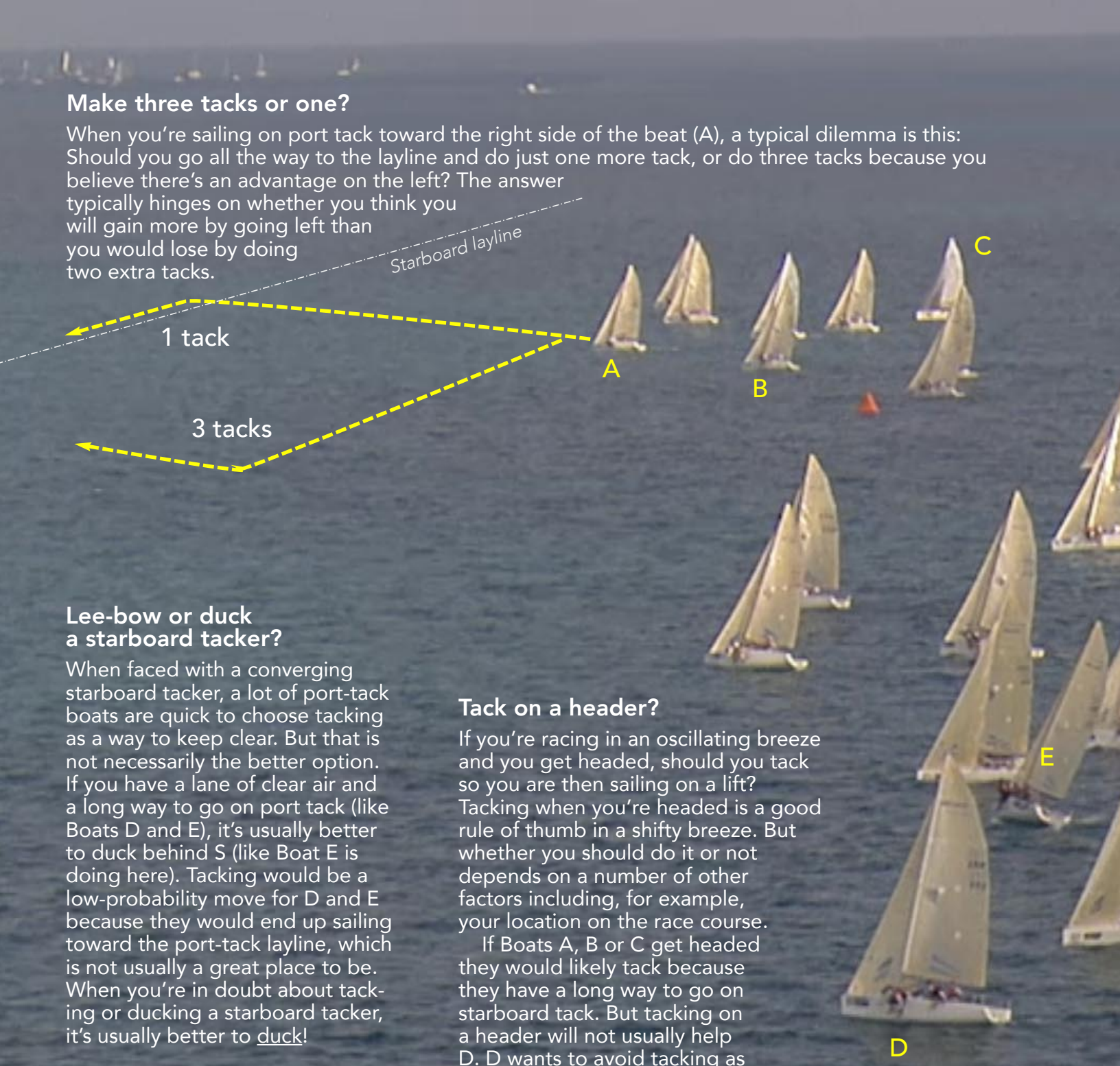
Should X tack to take advantage of the puff on her left?

One of the key rules of thumb for racing upwind is sailing toward more pressure. But should we do this at any cost? No! While it's true that getting to the puff above will make X go faster, there is also a cost in getting to that puff. Will it be worthwhile for X to make two extra tacks before the mark? That depends on a) how much she will lose in each tack, and b) how much she will gain in the puff. If it's light and lumpy (when tacks are costly), the puff would have to be pretty big in order to offset the losses due to tacking. But if the water is flat and the boat is good at roll tacking, then even a small puff might be worth getting.

Before tacking, think quickly about the potential benefits and costs of that maneuver. You know you will lose a certain amount of distance by tacking in the existing conditions. The key question is whether the gains you realize by tacking will more than outweigh the losses. It's a constant matter of balancing plusses and minuses.

Make three tacks or one?

When you're sailing on port tack toward the right side of the beat (A), a typical dilemma is this: Should you go all the way to the layline and do just one more tack, or do three tacks because you believe there's an advantage on the left? The answer typically hinges on whether you think you will gain more by going left than you would lose by doing two extra tacks.



Lee-bow or duck a starboard tacker?

When faced with a converging starboard tacker, a lot of port-tack boats are quick to choose tacking as a way to keep clear. But that is not necessarily the better option. If you have a lane of clear air and a long way to go on port tack (like Boats D and E), it's usually better to duck behind S (like Boat E is doing here). Tacking would be a low-probability move for D and E because they would end up sailing toward the port-tack layline, which is not usually a great place to be. When you're in doubt about tacking or ducking a starboard tacker, it's usually better to duck!

Tack on a header?

If you're racing in an oscillating breeze and you get headed, should you tack so you are then sailing on a lift? Tacking when you're headed is a good rule of thumb in a shifty breeze. But whether you should do it or not depends on a number of other factors including, for example, your location on the race course.

If Boats A, B or C get headed they would likely tack because they have a long way to go on starboard tack. But tacking on a header will not usually help D. D wants to avoid tacking as long as possible so she doesn't get any closer to the port layline.

Sail in bad air, or tack?

When you're in another boat's bad air (e.g. C above), should you always tack to clear your air? Not necessarily. It depends on whether you think the distance you'll lose by tacking is less than what you'd lose by staying in bad air. If the wind is light with choppy waves, it's usually better to tack for clear air. But if it's windy and/or you're on a lift, for example, you might lose less by sailing in bad than by tacking.

Sail Trim for fast tacking

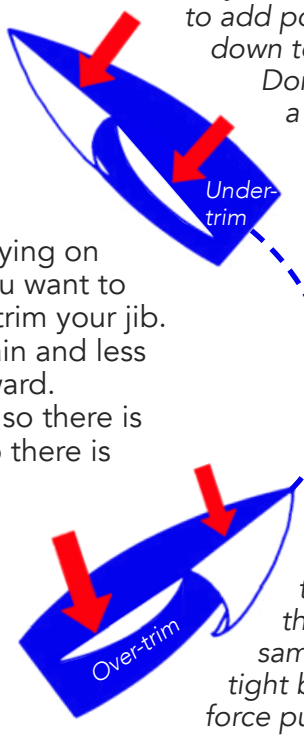
A tack is one of the biggest turns you make during a sailboat race. It's important to keep this in mind because turning a boat always slows you down. So any time you tack, speed is a priority.

One of the big speed robbers during a tack is rudder angle. The farther you turn the rudder, the more turbulence and drag it creates, so the obvious solution is to keep the rudder as straight as possible.

A great way to help the boat turn without over-relying on the rudder is by using the trim of your sails. When you want to turn to windward, over-trim your mainsail and under-trim your jib. This creates more wind force on the leech of your main and less on the jib; as a result the boat tends to turn to windward.

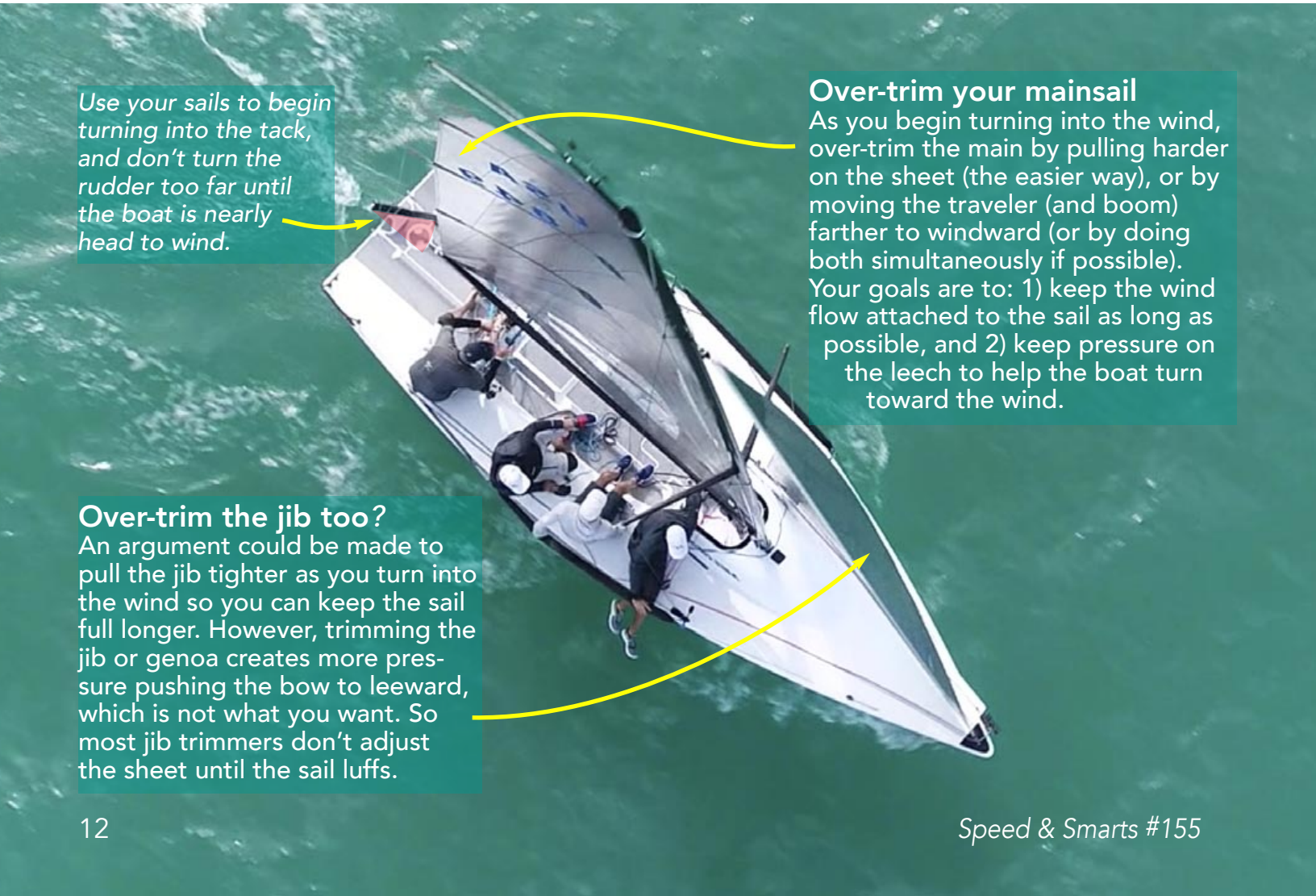
When you want to turn to leeward, ease the main so there is less wind force on the stern, and over-trim your jib so there is more wind force pushing the bow down.

Here's what this means for a tack: From the time you begin the tack until you reach head to wind, you are turning to windward, so over-trim your main and don't over-trim the jib. From the moment you pass head to wind until you reach your speed-build angle on the new tack, you are bearing off. This requires an eased main and relatively tight jib trim.



As you come out of a tack, trim the jib to add power and help pull the bow down to your speed-build angle. Don't over-trim your main (keep it a bit eased)! When you're trying to settle and accelerate the boat, the last thing you want is to fight windward helm. Keep the wind forces on the sails relatively equal so the boat goes straight ahead without using the rudder.

When you begin a tack, use your sails to help the boat turn toward the wind. Over-trim the main so you'll have more wind pressure on the main leech – this rotates the boat to windward. At the same time, don't trim the jib too tight because you want less wind force pushing the bow to leeward.



Use your sails to begin turning into the tack, and don't turn the rudder too far until the boat is nearly head to wind.

Over-trim your mainsail
As you begin turning into the wind, over-trim the main by pulling harder on the sheet (the easier way), or by moving the traveler (and boom) farther to windward (or by doing both simultaneously if possible). Your goals are to: 1) keep the wind flow attached to the sail as long as possible, and 2) keep pressure on the leech to help the boat turn toward the wind.

Over-trim the jib too?
An argument could be made to pull the jib tighter as you turn into the wind so you can keep the sail full longer. However, trimming the jib or genoa creates more pressure pushing the bow to leeward, which is not what you want. So most jib trimmers don't adjust the sheet until the sail luffs.

Don't back the jib!

It can be tempting to backwind the jib to help the boat turn through a tack, but this is not usually a good idea for several reasons: 1) the boat typically has plenty of turning momentum without the jib; 2) filling the jib when the boat is head to wind (*as shown here*) creates unwanted drag against the boat's forward motion; and 3) when a backed jib is released it blows over to leeward quickly and is hard to trim properly coming out of the tack. So unless the boat is slow and needs help in the turn, I would not recommend backing the jib.

This boat is tacking and has just about reached its new closehauled course on port tack. But the jib is completely flapping, which is slow. There are several reasons why the jib might still be luffing here:

- The jib trimmer (or grinder) didn't have enough warning about the tack;
- The trimmer did not take slack out of the windward sheet before the tack;
- The sail was backed during the tack, so when it was released it blew forcefully across to the new leeward side; and
- The boat was turned too fast, which made it difficult to trim the sail (a common problem with genoas and/or strong winds).

Ideal release & trim

Release the old sheet when a majority (>50%) of the jib is luffing;

- If you let it go sooner you will lose power;
- If you wait longer, the sail will backwind, which adds drag and causes the sail to blow to leeward when you finally release it.

Timing is critical so you can trim the new sheet quickly. The goal is to have the jib trimmed and filled by the time the boat reaches its new close-hauled course.

Don't trim the jib all the way in right away. Keep the sail eased slightly to help the boat accelerate; then trim slowly as the boat reaches full speed and its normal upwind angle. Try to trim the sail consistently to the same point out of every tack – this will help the skipper find the right exit angle.

Beware of 'tacking too close'!

RULES

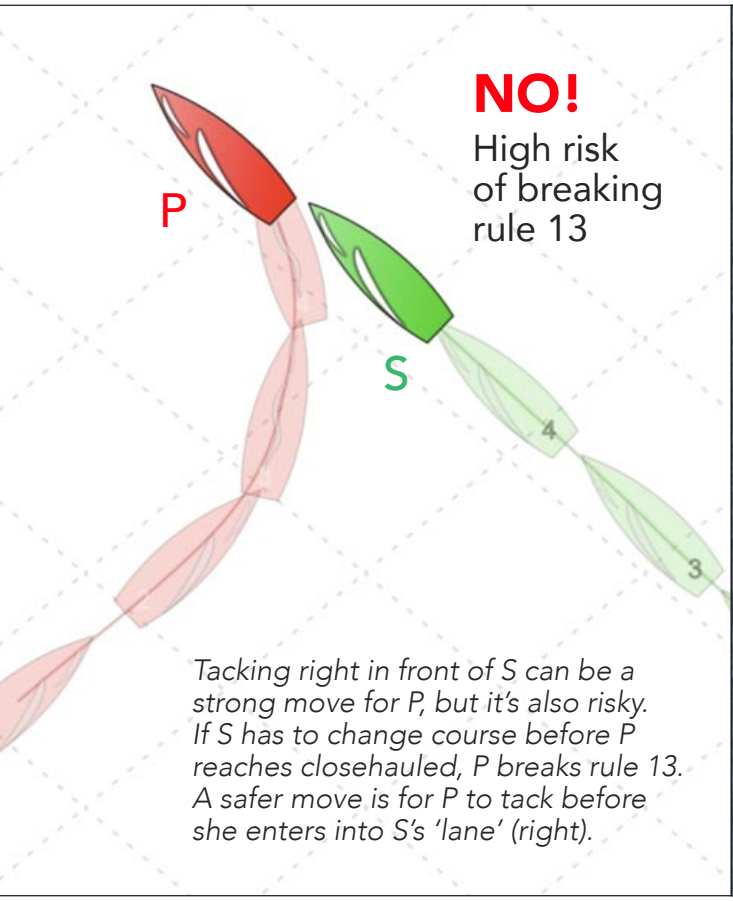
No discussion of 'Tacking' would be complete without consideration of the rules about tacking. The basic thing you should keep in mind is this: When you're tacking, you need to keep clear of all other boats. Or, to be more specific, you must keep clear of other boats from the moment you pass head to wind until the moment you reach your new closehauled course. This is explained in Rule 13 While Tacking (*below*).

So if you are planning to tack near one or more other boats, be careful. Tacking is costly enough on its own without the additional risk of having to take a penalty. As I've said throughout this issue, it is almost always better to avoid tacking than to do a bad tack (e.g. because you were unprepared) or a risky tack (e.g. because you 'tacked too close' to a competitor). Here are some notes about rule 13.

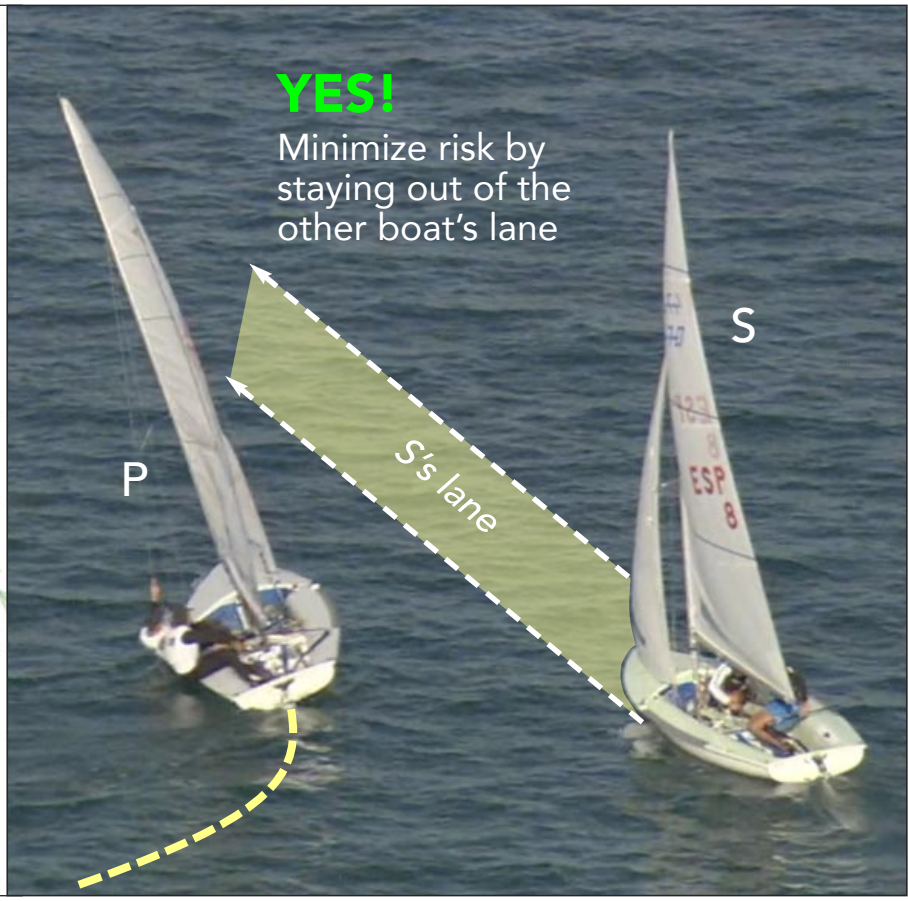
Is there an 'onus' on the boat that tacks?
No! An onus is a burden of proof, or a requirement that the tacking boat has to show she didn't tack too close, instead of the other boat showing she did. Rule 13 used to have an onus, but that is no longer the case. The tacking boat is now presumed innocent unless the evidence shows otherwise.

However, there is no doubt that in rule 13 protest hearings, the tacking boat is much more likely to be penalized than the non-tacking boat. Is that because there is an onus? No, it's due simply to the fact that the tacking boat is required to keep clear. If the protest committee penalizes either boat, it will probably be the boat that tacked.

So even though there is no onus in the rule, there is still significant risk in tacking close to another boat. Be careful when you're the tacker!



Tacking right in front of S can be a strong move for P, but it's also risky. If S has to change course before P reaches closehauled, P breaks rule 13. A safer move is for P to tack before she enters into S's 'lane' (right).



Rule 13 – WHILE TACKING
After a boat passes head to wind, she shall *keep clear* of other boats until she is on a close-hauled course. During that time rules 10, 11 and 12 do not apply . . .

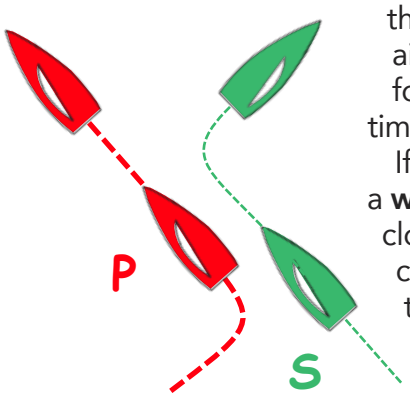
The closer P gets to S, the more likely P is to break rule 13. P can play it safe by tacking farther to leeward of S, but this is often not a great tactical move (see next page). A lee-bow tack is most effective when P gets close enough to S to give S bad air after the tack (and force S to tack away). If P's tack is 'too' safe, S will be able to keep sailing with clear air and pin P on starboard tack. ***So a lee-bow tack is always about risk vs. reward:*** *How close can P get to S (to maximize the effect of her bad air on S) without the risk of breaking rule 13?*

TACTICS

Master the common, critical *lee-bow tack*

When two boats converge on a beat, can the port-tack boat (P) tack into a strong lee-bow position? That's the key tactical question you have to ask every time you approach a boat on the opposite tack – the answer often has a big impact on your tactical options.

Strong Lee-bow

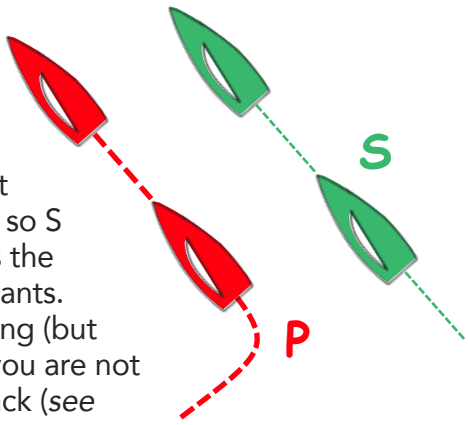


To make a **strong** lee-bow tack (left), P must tack close enough in front (and to leeward) of the starboard-tacker (S) that she will give bad air to S after her tack. P usually does this to force S to tack away for clear air after a short time – this gives P the option to tack again.

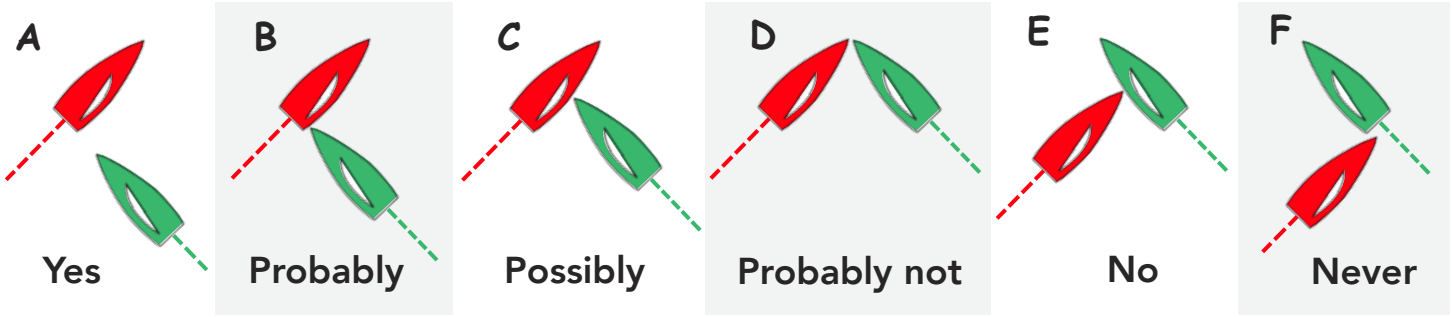
If P does not tack close enough to S, we call this a **weak** lee-bow tack (right). In this position P is not close enough to give S bad air on starboard tack, so S can keep sailing fast straight ahead. P then loses the tactical and strategic option to tack when she wants.

Solutions for P? Sail closer to S before tacking (but be careful about tacking too close), or realize you are not advanced enough to apply a strong lee-bow tack (*see below*) and bear off to pass behind S instead.

Weak Lee-bow



Can the Red boat make a **strong lee-bow tack** from each position?



When you're on port tack approaching a starboard tacker, look ahead and estimate how the boats will converge (i.e. if they kept going straight, how would they meet?). This is crucial for determining whether you can make a strong lee-bow tack in that situation or not.

If tacking is very easy (due to wind speed, flat water and boat type), you might be able to lee-bow successfully with only a half-boatlength lead (Situation C). In fact, in light-air and flat water, a good roll-tacking dinghy might make a strong lee-bow tack when they are just bow-to-bow (Situation D). But most boats could never do a lee-bow tack from that position in any condition.

As tacking becomes more difficult (e.g. when you have stronger wind, bigger waves or a heavier boat), the port-tack boat has to be much farther advanced in order to pull off a good lee-bow tack. If you are far enough ahead to just cross the starboard tacker (Situation A), you can usually do a good lee-bow tack without the risk of fouling or being 'rolled over' by S after the tack.

Wind strength	Position needed for P to make a strong lee-bow tack	
	Flat water	Waves
Light		
Medium		
Heavy		

Consider your boat and crew in the conditions described in this box. How far advanced would you have to be on port tack (P) in order to make a strong lee-bow tack on S? In each box put a letter from the diagrams above.

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Join a Free Webinar about this issue!

Dave is now doing a free webinar (***subscribers only***) after the publication of each issue of *Speed & Smarts*. The webinar for this issue will be **Wednesday, March 1, 2023 at 8:00 pm EST**.

Dave will be online to discuss tacking in greater detail and show some of the videos that were used for the photos inside. The webinar is free, but you must register to get the Zoom link.

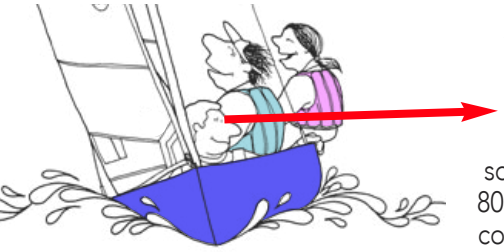
Webinar Topic: S&S Issue 155 – Tacking!

Date: Wednesday, **March 1** 8:00 to 9:30 pm EST (GMT -5)

Register here *Required to get a Zoom link.*

The Layline: A quintessential place to tack

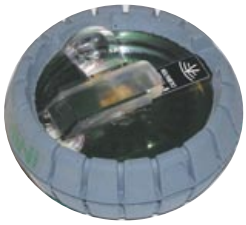
Whenever you approach a layline, a critical part of tacking is knowing where you will be heading when you get on the other tack. Are you on the layline, overstanding the mark, or perhaps not yet fetching it? This is not always easy, especially if you are very far from the mark, because your tacking angle changes frequently as a function of wind speed and wave state. Here are four techniques you can use to judge whether you'll be fetching the mark after a tack.



1. 'Eyeball' the windward mark

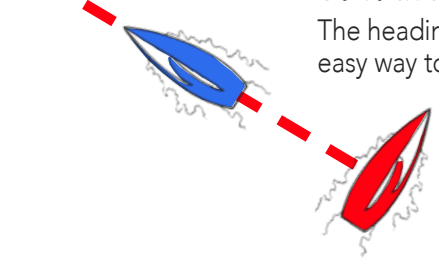
You should always do this (just as you should 'eyeball' every race-course decision). Taking a good look around helps you consider all relevant factors (e.g. the wind pressure you will have on the layline). Someone on your team may have a great feel for your tacking angle, so don't be afraid to rely on them. Also, many boats have an average tacking angle of about 80°, so you're at the layline when the mark is slightly forward of abeam. It's a good idea to combine this technique with a more objective approach like using a compass bearing.

2. Use a compass bearing



The use of a compass gives you a more objective and consistent approach to predicting your tacking angle. While you're sailing upwind, take note of your average headings on each tack. Then, while you are looking at the mark, use your heading from the other tack to judge when you're on the layline.

A compass mounted on your boat's centerline is great for getting your heading on each tack, but it's usually not so good for sighting the mark abeam. The best tool for this is a hand-bearing compass, which can be worn around the neck of the tactician or another crewmember.



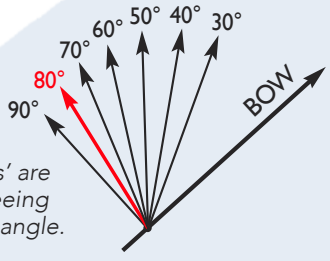
3. Watch the angle of boats on the other tack

The headings of boats on the other tack tell you a lot about where you'll be pointing after a tack. One easy way to call a layline is by looking down the centerline of a boat on the opposite tack as you cross behind them near the layline. This won't tell you how your layline will be affected by current or leeway, but it will give you a close estimate of your tacking angle.

The headings of other boats are also helpful when you're trying to find the optimal exit angle as you complete a tack. Look at nearby boats on the other tack, and come out of your tack slightly lower.

4. Use 'tacking lines' on your deck

This is a great guide if your boat is big enough to fit tacking lines on its deck. To make tacking lines work, you need to know your boat's tacking angle in the existing wind and sea conditions. Then find the matching line on the windward tacking line to see where you will be heading after a tack. For example, if you tack through 80°, your heading on the opposite tack will be 80° from your current course.



'Tacking lines' are helpful for seeing your tacking angle.